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Cyclone Tracy: A case study on adapting building regulations to minimise the impact of extreme wind events.

Tropical Cyclone *Tracy* laid waste to Darwin early on Christmas morning 1974. *Tracy* was a small but intense cyclone that generated gust wind speeds in excess of 217 km/h and destroyed much of the city's housing and infrastructure. Approximately 60% of all homes were completely destroyed, with only about 6% left immediately habitable. This damage left 40,000 people homeless and necessitated evacuation of 80% of the city's population. Cyclone *Tracy* showed the Australian, and international, engineering community that the magnitude and duration of cyclonic winds could be far greater than anyone had previously thought possible. Cyclone *Tracy* awoke everyone to the true risk of cyclonic wind storms and highlighted the consequences of deficient engineering design practices. In Darwin, the responsibility for the devastation clearly lay with those in charge of the construction of her buildings, which en mass, failed so spectacularly. The ensuing human catastrophe in essence stem from the simple fact that the places people went to shelter during and after the storm were not resilient enough to withstand the force of the cyclonic winds. Cyclone *Tracy* therefore represents an engineering failure, and necessitated an engineering solution to be found.

Unlike many other natural disasters, the solution for minimising losses during extreme wind events can largely be found with better engineering. In the aftermath of *Tracy* it was concluded that destruction was so vast because the structural integrity of housing had not been given the priority it deserved. This led the engineering community to promote the radical idea that housing be treated in the same light as all other, mostly larger, engineered structures, and be scientifically designed to withstand expected wind forces. This notion led to an outburst of research in the field and led to the introduction of new engineering based housing design standards, more specific design specifications for all buildings in cyclone regions, and the application of a more scientific method for the analysis of cyclonic wind risk. In short, a complete overhaul of the way housing was built in this country. It was no longer acceptable to suggest that the low cost of housing justified an unscientific approach to its design; after all, this was where the majority of the city's population sheltered during a disaster, and integrity had to be ensured to maximise occupant safety.

In all, this presentation investigates the response of the engineering community to the significant structural failures observed during Cyclone *Tracy*, and highlights the lessons learnt and the road taken to implement these lessons into present day building practices. Changes to building design philosophy, design standards and the construction inspection process are discussed, with positive and negative components highlighted. An attempt is made to quantify the improvements to structural resilience, with results broadly suggesting a reduction in damage of the order of 80%; a level that would likely alleviate the necessity of an evacuation. The presentation will conclude with a brief discussion of outstanding issues with the current design/building process, that if addressed, could minimise the future cost of similar extreme wind events.